25 March 1983
PROC. BIOL. SOC. WASH.
96(1), 1983

HYDROIDA FROM ESTUARIES OF SOUTH CAROLINA, USA: FAMILIES SERTULARIIDAE AND PLUMULARIIDAE

DALE R. CALDER

25 March 1983
PROC. BIOL. SOC. WASH.
96(1), 1983, pp. 7–28

HYDROIDA FROM ESTUARIES OF SOUTH CAROLINA, USA: FAMILIES SERTULARIIDAE AND PLUMULARIIDAE

Dale R. Calder

Abstract.—Six species of Sertulariidae and five species of Plumulariidae were identified in collections of hydroids from estuaries of South Carolina. *Sertularia exigua* Allman, 1877, is synonymized with *Dynamena cornicina* McCrady, 1859, and *Aglaophenia rigida* Allman, 1877, is placed in synonymy with *A. trifida* L. Agassiz, 1862. *Aglaophenia trifida* occurs in two distinct colony forms in estuaries of South Carolina, but the two variants are not regarded as separate taxa. *Obelia marginata* Allman, 1877, from the Atlantic Ocean and *Campanularia marginata* Bale, 1884, from Australia belong to the genus *Thyroscyphus* Allman, 1877. *Thyroscyphus balei,* new name, is proposed as a replacement name for the junior secondary homonym *T. marginatus* (Bale, 1884).

The assemblage has a distinct warm water affinity. All 11 species range at least as far south as the Caribbean, while but four occur north of the Carolina coast on substrates other than pelagic *Sargassum.* Only two of the species, *Sertularella conica* and *Aglaophenia rigida,* are restricted to the western Atlantic. No representatives of either family were collected below salinities of 15‰ in the study area.

Studies by McCrady (1859) and Fraser (1912) form the basis for much of the information presently available on hydroids of estuarine and nearshore areas between Cape Hatteras, North Carolina, and Cape Canaveral, Florida. Other records of hydroids from the Carolinian region are scattered in various taxonomic papers covering broad geographic areas, such as those of Allman (1877), Jäderholm (1896), Nutting (1900, 1904, 1915), Stechow (1923), Fraser (1943, 1944) and Vervoort (1972). Additional data are given in investigations of fouling communities (McDougall 1943; Dean and Bellis 1975; Sutherland 1977, 1981; Sutherland and Karlson 1977; Karlson 1978), and faunal studies (Pearse 1936; Pearse and Williams 1951; Stephenson and Stephenson 1952; Wells 1961; Wells, Wells, and Gray 1964; Cain 1972; Howard and Frey 1975), as well as miscellaneous other publications (Verrill 1872; Fewkes 1881; Brooks 1886; Mayer 1910a, b; Sandifer *et al.* 1974; Calder 1976; Calder and Hester 1978). Despite its dated systematics, Fraser's (1944) monograph continues to be the most comprehensive source of information on hydroids of the region.

Hydroids occur from marine to freshwater environments and are an important constituent of epibenthic assemblages in estuaries. This paper is a systematic account of the species belonging to the families Sertulariidae and Plumulariidae found in estuaries of South Carolina.

Materials and Methods

Hydroids were sorted from benthic samples collected between 1973 and 1978 at 130 stations in estuaries of South Carolina. These stations encompassed the

Table 1.—Locations, depths, substrate types, and observed bottom salinity ranges for stations where hydroids of the families Sertulariidae and Plumulariidae were collected in estuaries of South Carolina.

Station	Location	N	W	Depth (m)	Substrate	Salinity (‰)
LRA7	Little River Inlet	33°51′40″	78°32′31″	4	sand, shell	33
LRA8	Little River Inlet	33°52′00″	78°32′48″	2	sand, shell	33
MI07	Murrells Inlet	33°30′00″	79°01′34″	3	sand, shell	34
MI09	Murrells Inlet	33°33′12″	79°01′43″	2	sand, shell	34
MI10	Murrells Inlet	33°33′25″	79°01′44″	3	sand, shell	34
MI12	Murrells Inlet	33°33′16″	79°01′08″	1	sand, shell	34
MI13	Murrells Inlet	33°33′28″	79°01′35″	2	sand, shell	34
MI15	Murrells Inlet	33°33′37″	79°01′24″	1	sand, shell	34
MI16	Murrells Inlet	33°33′18″	79°02′02″	3	sand, shell	34
MI17	Murrells Inlet	33°33′08″	79°02′14″	1	silty sand, shell	34
YB02	Winyah Bay	33°13′21″	79°11′14″	5	sand, shell	—
NS00	North Santee River	33°09′00″	79°14′09″	0	sand, shell	—
NS01	North Santee River	33°08′34″	79°14′48″	3	sand, shell	—
NB02	North Santee River	33°10′00″	79°14′30″	1	sand, shell	—
BB01	Bulls Bay	32°57′27″	79°36′57″	4	mud, shell	34
BB02	Sewee Bay	32°57′27″	79°38′15″	2	mud, shell	34
SB03	Sewee Bay	32°56′51″	79°38′33″	2	mud, shell	32–35
SB04	Sewee Bay	32°56′47″	79°38′30″	3	mud, shell	32–35
SB05	Sewee Bay	32°56′35″	79°39′07″	4	mud, shell	32–35
SB07	Sewee Bay	32°56′24″	79°39′00″	2	mud, sand, shell	31–35
SB08	Sewee Bay	32°56′17″	79°38′45″	2	mud, shell	31–35
SB10	Sewee Bay	32°55′49″	79°39′25″	4	mud, shell	31–34
SB13	Sewee Bay	32°55′57″	79°38′29″	4	mud, shell	31–35
SB15	Sewee Bay	32°55′23″	79°39′37″	4	mud, shell	31–34
SB18	Sewee Bay	32°55′27″	79°38′27″	2	mud, shell	30–35
B003	Bulls Bay	32°55.9′	79°36.2′	5	mud, sand	28–34
B002	Prices Creek	32°54.2′	79°40.7′	8	sand, shell	29–34
CI01	Capers Inlet	32°51′30″	79°42′35″	3	sand, shell	34
B001	Inlet Creek	32°47.5′	79°49.5′	4	sand, shell	23–33
CH00	Charleston Harbor	32°45′20″	79°51′40″	20	sand, shell	—
J003	Charleston Harbor	32°44.9′	79°51.6′	10	mud, shell	22–33
J002	Charleston Harbor	32°47.1′	79°53.2′	3	mud	16–28
J001	Charleston Harbor	32°45.4′	79°55.1′	7	mud, sand	16–25
CH02	Charleston Harbor	32°46′18″	79°53′17″	12	mud, shell	—
KP01	Stono Inlet	32°37′25″	79°59′26″	10	sand, shell	29
KP02	Stono River	32°38′03″	80°00′32″	10	sand, shell	28
KP04	Stono River	32°40′29″	80°00′10″	7	sand, shell	24
KP07	Kiawah River	32°37′29″	80°04′33″	6	sand, shell	25
KP08	Kiawah River	32°36′54″	80°06′43″	2	mud, shell	24
E001	Wadmalaw Sound	32°41.2′	80°10.4′	7	sand, shell, mud	17–27
DE10	North Edisto River	32°39′06″	80°15′25″	11	sand, shell	22–33
E003	North Edisto River	32°38.8′	80°15.7′	7	sand, shell	19–31
E002	Toogoodoo Creek	32°41.3′	80°17.3′	4	sand, shell, mud	21–26
DE04	North Edisto River	32°37′41″	80°16′34″	7	sand, mud, shell	22–33
DE05	North Edisto River	32°37′22″	80°16′16″	10	pebbles	21–34
DE06	North Edisto River	32°36′53″	80°15′55″	10	sand, shell	27–31
E005	Steamboat Creek	32°36.2′	80°17.7′	7	sand, mud, shell	23–29
DE07	North Edisto River	32°36′33″	80°15′10″	9	sand, shell	27–31
DE08	North Edisto River	32°36′21″	80°14′00″	8	sand	24–34
E006	North Edisto River	32°36.5′	80°14.8′	8	sand	25–30
E007	North Edisto River	32°35.9′	80°13.5′	8	mud	26–31

Table 1.—Continued

Station	Location	N	W	Depth (m)	Substrate	Salinity (‰)
AC01	Adams Creek	32°35′48″	80°12′22″	3	sand, shell	—
E008	North Edisto River	32°33.6′	80°10.7′	10	sand, shell	29–31
DE01	Dawho River	32°37′25″	80°17′05″	4	mud	19–29
D004	South Edisto River	32°29.7′	80°21.2′	7	sand	24–33
H003	St. Helena Sound	32°30.9′	80°27.9′	5	sand, mud, shell	21
BR08	Beaufort River	32°24′46″	80°40′53″	6	sand, shell	—
P002	Colleton River	32°16.2′	80°43.7′	6	mud, sand	27–32
P001	Port Royal Sound	32°16.2′	80°48.5′	8	sand, mud, shell	24–31
P006	Chechessee River	32°17′30″	80°45′00″	9	sand	30
G001	Calibogue Sound	32°10.9′	80°47.8′	7	sand, mud, shell	25–30

region from Little River Inlet in the northeast to the Wright River in the southwest, and extended from the mouth to the head of various estuarine systems in the state. Representatives of the families Sertulariidae and Plumulariidae were found at 61 of these stations (Table 1). Most specimens were obtained in epifaunal collections made with modified oyster dredges and otter trawls, but a few were sorted from infaunal samples taken using Petersen grabs. Collections were preserved in 10% neutralized formaldehyde.

Bottom water samples, taken in conjunction with most benthic collections, were obtained with Van Dorn bottles and analyzed for salinity in the laboratory with a Beckman RS7B induction salinometer.

Hydroids occurring on pelagic *Sargassum* are allochthonous to South Carolina estuaries and were not included in this study. The synonymy list for each species includes published records from estuaries between Cape Hatteras, North Carolina, and Cape Canaveral, Florida. Descriptions and illustrations are based entirely on specimens from estuaries of South Carolina. The terminology employed largely follows that used in the monograph on South African hydroids by Millard (1975). A reference collection has been deposited in the Department of Invertebrate Zoology, Royal Ontario Museum.

Systematic Account

Family Sertulariidae Fleming, 1828

Dynamena Lamouroux, 1812

Dynamena cornicina McCrady, 1859

Figs. 1, 2

Dynamena cornicina McCrady, 1859:204.—Calder, 1976:169.—Calder and Hester, 1978:91.

Sertularia cornicina.—Verrill, 1874:408, 411, 733.—Fraser, 1912:374, fig. 38; 1944: 279, fig. 266.

Sertularia exigua Allman, 1877:24, pl. 16, figs. 7, 8.

Sertularia complexa Clarke, 1879:245, pl. 4, figs. 26–28.

Sertularia moluccana Pictet, 1893:50, pl. 2, figs. 42, 43.

Desmoscyphus palkensis Thornely, 1904:119, pl. 2, figs. 7A, B.

Sertularia densa Stechow, 1919:93, fig. J1.

Sertularia cornicina f. *pinnata* Jarvis, 1922:339.

Collection records.—Sta. MI07, dredge, 29 May 1975. Sta. MI09, dredge, 29 May 1975. Sta. MI10, dredge, 29 May 1975. Sta. MI12, dredge, 29 May 1975. Sta. MI13, dredge, 29 May 1975. Sta. MI15, dredge, 29 May 1975. Sta. MI16, dredge, 29 May 1975. Sta. BB02, dredge, 11 Aug 1977. Sta. SB03, dredge, 22 Aug 1977. Sta. SB04, dredge, 25 July 1978. Sta. SB07, dredge, 22 Aug 1977. Sta. SB10, dredge, 22 Aug 1977, 25 July 1978. Sta. SB13, dredge, 25 July 1978. Sta. SB15, dredge, 22 Aug 1977. Sta. B003, dredge, 12 Aug 1974, 22 Oct 1974, 13 Oct 1975. Sta. B002, dredge, 23 Oct 1973, 15 Apr 1974, 12 Aug 1974, 22 Oct 1974, 13 Oct 1975, 5 Jan 1976. Sta. B001, dredge, 16 Oct 1974, 2 Apr 1976. Sta. J003, dredge, 1 Aug 1975, 1 Apr 1976. Sta. KP07, dredge, 15 Mar 1977. Sta. KP08, dredge, 16 Mar 1977. Sta. DE04, dredge, 21 Nov 1977, 17 Oct 1978. Sta. DE05, dredge, 17 Oct 1978. Sta. DE07, dredge, 21 Nov 1977. Sta. E008, dredge, 2 Oct 1974. Sta. D004, dredge, 9 Jan 1974. Sta. BR08, dredge, 27 Mar 1974, 8 Oct 1975. Sta. P002, dredge, 4 Oct 1973, 5 Apr 1974, 7 Aug 1974, 8 Oct 1974. Sta. P001, dredge, 4 Oct 1973, 7 Aug 1974, 8 Oct 1974. Sta. P006, trawl, 7 Aug 1974. Sta. G001, dredge, 4 Oct 1973, 7 Aug 1974, 8 Oct 1974, 8 Apr 1975, 8 Oct 1975.

Description.—Unbranched colonies reaching 2 cm high; color in life bright yellow. Hydrocaulus monosiphonic, straight, arising from a creeping hydrorhiza; basal part athecate, length variable but usually about 1 mm long, articulating with upper thecate part by an oblique hinge-joint; thecate part divided by oblique nodes, internodes 491–784 μm long, each with an opposite pair of frontally-placed hydrothecae; thecate part of a few hydrocauli having an irregularly-placed athecate internode marked by an oblique hinge-joint distally. Hydrothecae cylindrical, distal half curved outward, contiguous frontally, not touching across back of internode; abcauline wall concave except for an occasional basal bulge, 293–386 μm long; contiguous part of adcauline wall straight, 246–363 μm long, free part convex, 199–293 μm long; diameter at base of hydrotheca 129–188 μm. Hydrothecal orifice oval, 129–158 μm wide from adcauline to abcauline wall; margin with 2 prominent lateral teeth and a smaller median adcauline tooth, occasionally renovated. Operculum consisting of a large abcauline and a smaller adcauline valve divided by a median line. Perisarc of abcauline wall expanded just below margin, but intrathecal teeth lacking.

Gonothecae oval, resembling chinese lanterns with about 6 rounded, transverse ridges, 680 μm wide, 1000 μm long from base to orifice, arising by short pedicels from hydrorhiza. Walls round in cross-section, orifice round, 365 μm in diameter, at end of short collar.

Remarks.—Charleston Harbor, South Carolina, is the type-locality of this circumglobal hydroid. According to Nutting (1904), McCrady's (1859) types of this species were destroyed by fire in Charleston during the American Civil War. I was unable to locate any of McCrady's hydrozoan material at the Charleston Museum.

Sertularia exigua, originally described by Allman (1877) from Cape Fear, North Carolina, is regarded as a synonym of *D. cornicina.* Allman's types of *S. exigua* could not be located at the Museum of Comparative Zoology where they were originally deposited (Nutting 1904), but his descriptions and illustrations of the species are indistinguishable from *D. cornicina.* The back of the hydrothecal pairs, rather than the front, is shown in Allman's drawings of the species.

Dynamena cornicina is often a substrate for the hydroid *Hebella scandens*

(Bale 1888), and it was probably hydrothecae of the latter that McCrady (1859) presumed, with considerable reservation, to be gonothecae.

Known range.—Western Atlantic: Massachusetts to Brazil; Bermuda. Elsewhere: Circumglobal, tropical and temperate waters.

Dynamena quadridentata (Ellis and Solander, 1786)
Fig. 3

Sertularia quadridentata Ellis and Solander, 1786:57, pl. 5, fig. G.
Pasythea (Sertularia) quadridentata.—Lamouroux, 1812:183.
Pasythea quadridentata.—Lamouroux, 1816:156.—Fraser, 1912:372, fig. 36.
Pasythea nodosa Hargitt, 1908:114, figs. 13–15.
Pasya quadridentata.—Stechow, 1923:166.
Pasya elongata Stechow and Müller, 1923:469, pl. 27, fig. 8.
Dynamena gibbosa Billard, 1924:650, fig. 2G.
Dynamena quadridentata.—Billard, 1925:194, fig. 42.
Dynamena quadridentata var. *elongata* Billard, 1925:195, fig. 43A, B, C, D.
Dynamena quadridentata var. *nodosa* Billard, 1925:197, fig. 43E.

Collection record.—Sta. J003, dredge, 1 Apr 1976.

Description.—Hydrorhiza with distinct internal ridges of perisarc. Colonies 4.5 mm high; hydrocaulus monosiphonic, straight, unbranched; basal portion athecate, short, with an oblique hinge-joint distally; thecate part divided either by oblique and frequently indistinct nodes, or by oblique hinge-joints. Internodes variable in length with 1–3 opposite pairs of frontally-situated hydrothecae; hydrothecal pairs usually contiguous for a varying distance in front, not touching across back of internode. Base of hydrotheca above abutting adcauline wall of hydrotheca below when 2 or more pairs of hydrothecae present per internode. Hydrothecae varying from nearly cylindrical to somewhat tumid, narrowest just below margin; abcauline wall 187–281 μm long; solitary pair, or proximal pairs of a group curved outward with axes oblique to internode, adcauline wall convex, abcauline wall concave except for basal bulge; distal pair of a group with adnate portions of adcauline wall straight, axes parallel to internode, margin curved abruptly outward, abcauline wall concave. Hydrothecal margin oval with 2 prominent lateral teeth and a smaller median adcauline tooth. Operculum consisting of a large abcauline and a smaller adcauline valve. Intrathecal teeth present.

Gonothecae absent.

Remarks.—This species is common on pelagic *Sargassum,* but was collected from benthic algae at only one station in the study area.

Known range.—Western Atlantic: North Carolina to Brazil; Bermuda; northward to Massachusetts on floating *Sargassum.* Elsewhere: Circumglobal, tropical and warm temperate waters.

Sertularella Gray, 1848
Sertularella conica Allman, 1877
Fig. 4

Sertularella conica Allman, 1877:21, pl. 15, figs. 6, 7.—Fraser, 1912:373, fig. 37.
Sertularella gayi.—Verrill, 1900:571; 1907:319, fig. 170 [not *Sertularella gayi* (Lamouroux, 1821)].

Sertularella inconstans.—Calder and Hester, 1978:91 (not *Sertularella inconstans* Billard, 1919).

Collection record.—Sta. CH00, trawl, 22 May 1974.

Description.—Unbranched, sympodial colonies reaching 1 cm high. Hydrocaulus monosiphonic, geniculate, divided into internodes by oblique nodes sloping alternately in opposite directions, an annulation often evident above each node; perisarc thick. Internodes variable in length, first very short; each internode with a distal hydrotheca; diameter at nodes 135–181 μm. Hydrothecae alternate, slender, flask-shaped, widest at juncture of adcauline wall and internode, narrowest just below margin, walls with 4–8 distinct annulations; adcauline wall convex, length adnate 211–257 μm, length free 293–445 μm; abcauline wall slightly convex basally, slightly concave distally, 398–562 μm long. Hydrothecal margin with 4 distinct, equal teeth, operculum of 4 valves; aperture quadrate or irregularly oval, 187–211 μm wide from adcauline to abcauline tooth; 3 well-developed internal teeth, 2 additional smaller ones occasionally evident.

Gonothecae absent.

Remarks.—This species is very similar to *Sertularella robusta* Coughtrey, 1876, as described by Pennycuik (1959), Ralph (1961), Blanco (1968), Vervoort (1972), Watson (1973), and Vervoort and Vasseur (1977). The latter species occurs over a wide area in the southern hemisphere. *Sertularella conica* has been observed in Bermuda (Calder, unpublished) and was recorded earlier from Bermuda by Verrill (1900, 1907) as *Sertularella gayi* (Lamouroux, 1821). Bennitt's (1922) record of *S. tenella* (Alder, 1856) from Bermuda may also have been based on this species. *Sertularella conica* is readily distinguished from *S. gayi* in having internal teeth below the margin of the hydrotheca. Fraser's (1913, 1944) accounts of this species from the Canso Banks, Nova Scotia, as well as those from the eastern Pacific (Fraser 1937, 1948), do not correspond with *S. conica*. Specimens identified as *S. conica* from the Tortugas by Gemerden-Hoogeveen (1965) also appear to be based on material of another species.

Sertularella conica was collected once in estuaries of South Carolina. Specimens were found growing on hydrocauli of *Aglaophenia trifida* taken at the entrance of Charleston Harbor.

Known range.—Western Atlantic: North Carolina to the Caribbean Sea; Bermuda.

Sertularia Linnaeus, 1758

Sertularia distans Lamouroux, 1816

Fig. 5

Sertularia distans Lamouroux, 1816:191. Not *Dynamena distans* Lamouroux, 1816:180, pl. 5, figs. 1a, 1b [=*Dynamena pumila* (Linnaeus, 1758)].

Sertularia gracilis Hassall, 1848:2223.

Dynamena gracilis.—Marktanner-Turneretscher, 1890:240 (part).

Sertularia pourtalesi Nutting, 1904:59, pl. 5, fig. 5.

Sertularia stookeyi Nutting, 1904:59, pl. 5, figs. 6, 7.—Fraser, 1912:375, fig. 39.—Calder, 1976:169.—Calder and Hester, 1978:91.

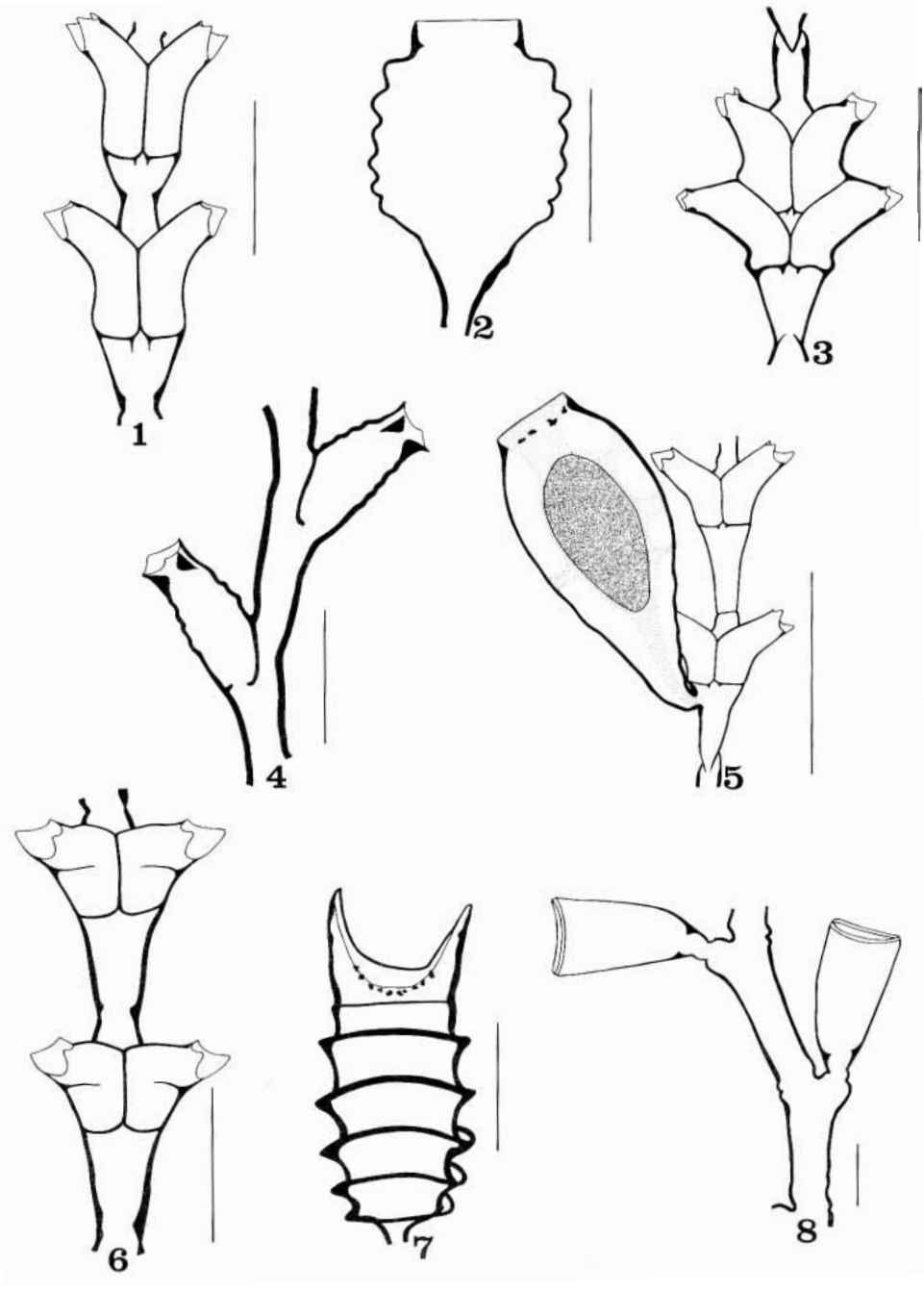
Sertularia heterodonta Ritchie, 1909a:79, fig. 4 [not *Dynamena heterodonta* (Jarvis, 1922)].

Sertularia distans var. *garcilis* Billard, 1912:465.
Tridentata heterodonta.—Stechow, 1923:205.
Tridentata pourtalesi.—Stechow, 1923:205.
Tridentata stookeyi.—Stechow, 1923:205.
Tridentata gracilis.—Stechow, 1923:208, fig. G.
Sertularia distans gracilis Millard, 1964:49.
Tridentata distans.—Hirohito, 1969:23, fig. 16.

Collection records.—Sta. BB01, dredge, 11 Aug 1977. Sta. BB02, dredge, 11 Aug 1977. Sta. SB03, dredge, 22 Aug 1977, 28 Apr 1978, 25 July 1978. Sta. SB04, dredge, 22 Aug 1977. Sta. SB05, dredge, 22 Aug 1977. Sta. SB07, dredge, 22 Aug 1977. Sta. SB10, dredge, 22 Aug 1977. Sta. SB15, dredge, 22 Aug 1977, 25 May 1978. Sta. B003, dredge, 22 Oct 1974. Sta. B002, trawl, 23 Apr 1973, 23 July 1973, 23 Oct 1973; dredge, 14 Jan 1974, 15 Apr 1974, 12 Aug 1974, 22 Oct 1974, 16 Apr 1975, 13 Oct 1975, 5 Jan 1976. Sta. B001, dredge, 9 Oct 1973, 17 Jan 1974, 12 Apr 1974, 15 Aug 1974, 16 Oct 1974, 13 Oct 1975, 2 Jan 1976, 2 Apr 1976. Sta. J003, Petersen grab, 1 Oct 1973; dredge, 1 Oct 1973. Sta. CH02, dredge, 10 Oct 1973. Sta. J002, dredge, 14 Oct 1975. Sta. KP01, dredge, 14 Mar 1977. Sta. KP02, dredge, 14 Mar 1977. Sta. KP04, dredge, 14 Mar 1977. Sta. KP07, dredge, 15 Mar 1977. Sta. DE10, dredge, 7 Mar 1978. Sta. E003, dredge, 2 Apr 1974, 2 Aug 1974. Sta. E002, trawl, 15 Sep 1973. Sta. DE04, dredge, 15 Dec 1977. Sta. DE05, dredge, 21 Nov 1977, 17 Oct 1978. Sta. DE06, dredge, 21 Nov 1977, 13 June 1978. Sta. E005, dredge, 7 Jan 1974. Sta. DE07, dredge, 21 Nov 1977, 15 Dec 1977. Sta. DE08, dredge, 7 Mar 1978, 17 Oct 1978. Sta. E006, trawl, 7 Aug 1973; dredge, 1 Feb 1974. Sta. E007, dredge, 5 Aug 1974, 9 Oct 1975, 11 Jan 1976. Sta. E008, trawl, 9 Apr 1973, 2 July 1973, 5 Sep 1973; dredge, 2 Oct 1973, 7 Jan 1974, 3 Apr 1974, 2 Oct 1974. Sta. D004, dredge, 3 Oct 1973, 9 Jan 1974. Sta. BR08, dredge, 8 Oct 1975. Sta. P002, dredge, 5 Apr 1974, 8 Oct 1974. Sta. P001, dredge, 5 Apr 1974. Sta. G001, dredge, 8 Oct 1974.

Description.—Colonies up to 2 cm high; usually unbranched but occasionally with one or more branches; branch arising either from an apophysis inserting just below a hydrotheca or from renovation of an old hydrotheca. Hydrocaulus monosiphonic, straight, arising from a creeping hydrorhiza; basal part of variable length but usually less than 500 μm long, consisting of 1 or 2 athecate internodes marked by oblique hinge-joints; thecate part divided by slightly oblique and often obscure nodes, internodes 398–620 μm long, each with an opposite pair of frontally-placed hydrothecae; thecate part of some hydrocauli having one or more irregularly-placed athecate internodes with oblique hinge-joints distally. Hydrothecae horn-shaped, curved outward; pair usually contiguous but occasionally separated frontally, not touching across back of internode; abcauline wall concave, 181–222 μm long; adcauline wall 246–281 μm long, length contiguous 0–105 μm, diameter at base of hydrotheca 64–117 μm. Hydrothecal orifice oval, 70–94 μm wide from adcauline to abcauline wall; margin with 2 prominent lateral teeth and a small median adcauline tooth. Operculum consisting of an abcauline valve and an adcauline valve with a median line. Intrathecal teeth lacking. Hydranth with an abcauline caecum.

Gonothecae oval, with about 4 faint, rounded ridges, maximum diameter 351–433 μm, length from base to orifice 749–842 μm, arising by short pedicels from



Figs. 1–8. Family Sertulariidae. 1, *Dynamena cornicina,* hydrothecae, station P001; 2, *Dynamena cornicina,* gonotheca, station P001; 3, *Dynamena quadridentata,* hydrothecae, station J003; 4, *Sertularella conica,* hydrothecae, station CH00; 5, *Sertularia distans,* hydrothecae and gonotheca, station E002; 6, *Sertularia marginata,* hydrothecae, station D004; 7, *Sertularia marginata,* gonotheca, station D004; 8, *Thyroscyphus marginatus,* hydrothecae, station B002, scale bars = 500 μm.

hydrocaulus at bases of hydrothecae. Walls oval or nearly round in cross-section; orifice round, 211–252 μm in diameter, at end of a short collar; submarginal teeth present.

Remarks.—Specimens from South Carolina were compared with Nutting's (1904) type-material of *S. stookeyi* from the Great Bahama Banks (USNM 19710) and are inseparable from them morphologically. *Sertularia stookeyi* has been included in the synonymy of *S. distans* Lamouroux, 1816 by Cornelius (1979).

Sertularia distans is widespread in estuaries of South Carolina in salinities above 21‰. It frequently occurs in dense masses on the axes of dead specimens of the octocoral *Leptogorgia virgulata*.

Known range.—Western Atlantic: Massachusetts to Brazil; Bermuda. Elsewhere: Circumglobal, tropical and temperate waters.

Sertularia marginata (Kirchenpauer, 1864)
Figs. 6, 7

Dynamena marginata Kirchenpauer, 1864:13, fig. 8. Not *Sertularia marginata* Allman, 1877:23, pl. 16, figs. 1, 2 (=*Sertularia striata* Totton, 1930).
Sertularia flosculus Thompson, 1879:104, pl. 17, fig. 2.
Sertularia amplectens Allman, 1885:141, pl. 16, figs. 3, 4.
Desmoscyphus pectinatus Allman, 1888:71 (part).
Desmoscyphus gracilis Allman, 1888:71, pl. 34, figs. 2, 2a–c.
Desmoscyphus inflatus Versluys, 1899:42, figs. 11–13.
Sertularia inflata.—Jäderholm, 1903:286.
Sertularia versluysi Nutting, 1904:53, pl. 1, figs. 4–9.—Fraser, 1912:375, fig. 40.
Sertularia pluma Hartlaub, 1905:661.
Sertularia marginata.—Bale, 1913:125 (part).—Calder, 1976:169.—Calder and Hester, 1978:91.
Amphisbetia marginata.—Stechow, 1921:258.
Tridentata flosculus.—Stechow, 1923:204.
Tridentata inflata.—Stechow, 1923:205.
Sertularia marginata f. *typica* Vannucci, 1949:248.
Sertularia marginata f. *laxa* Vannucci, 1949:248, pl. 3, fig. 46.

Collection records.—Sta. J003, dredge, 1 Oct 1973. Sta. J002, dredge, 14 Oct 1975. Sta. J001, trawl, 8 Oct 1973. Sta. D004, dredge, 3 Oct 1973. Sta. H003, dredge, 10 Oct 1975.

Description.—Hydroids up to 6.5 cm high, arising from a tangled hydrorhiza. Hydrocaulus straight, monosiphonic, alternately branched, perisarc thick; basal part athecate, length variable but usually several mm long, occasionally with one or more transverse or slightly oblique nodes, separated from upper thecate part by an oblique hinge-joint; thecate part divided by rather indistinct transverse nodes, internodes short, each with an apophysis and an axillary hydrotheca basally and a pair of subopposite hydrothecae distally, hydrothecal pair separated front and back. Apophyses given off alternately from opposite sides of hydrocaulus, separated from hydroclade by a transverse node, node sometimes obscure. Hydrocladia unbranched, reaching 1 cm long, directed upward; first internode short, athecate, node transverse proximally, an oblique hinge-joint distally; remaining internodes each with one pair of frontally-placed hydrothecae, nodes

oblique, often indistinct or entirely obliterated. Hydrothecae in opposite pairs, pair occasionally separated but usually contiguous frontally, not touching across back of internode; each hydrotheca expanded basally, turned abruptly outward and slightly upward distally, tapering towards margin; abcauline wall concave, 176–222 μm long with a prominent intrathecal septum; contiguous part of adcauline wall straight, length contiguous 0–211 μm, free part convex, 129–304 μm long. Hydrothecal orifice oval, margin with very small median adcauline tooth and 2 large, pointed lateral teeth appearing unequal in size due to angle of aperture. Operculum consisting of a large abcauline and a smaller adcauline valve divided by a median line.

Gonothecae resembling Chinese lanterns, 760 μm wide, 1400 μm long from base to orifice, arising by short pedicels from hydrocaulus just above axillary hydrothecae. Walls oval in cross-section, with 5–6 transverse ridges; orifice hemispherical, bounded by 2 spines; spines horn-shaped, 255–350 μm long.

Remarks.—Van Gemerden-Hoogeveen (1965) recognized that *Sertularia inflata* (Versluys, 1899) was very difficult to separate from *S. marginata,* but she believed that they could be distinguished on the basis of differences in gonotheca arrangement and shape as well as hydrotheca shape. However, I have followed Billard (1925), Vannucci Mendes (1946), Ralph (1961), Mammen (1965a), Millard and Bouillon (1974), Millard (1975), Garcia *et al.* (1980), and others in regarding *S. inflata* as a synonym of *S. marginata.*

Known range.—Western Atlantic: North Carolina to Brazil; Bermuda; northward to Massachusetts on floating *Sargassum.* Elsewhere: Circumglobal, tropical and subtropical waters.

Thyroscyphus Allman, 1877
Thyroscyphus marginatus (Allman, 1877), new combination
Fig. 8

Obelia marginata Allman, 1877:9, pl. 6, figs. 1, 2.
Campanularia insignis Fewkes, 1881:129.
Not *Campanularia marginata* Bale, 1884:154, pl. 1, fig. 2.
Lytoscyphus marginata.—Ritchie, 1909b:260.
Lytoscyphus marginatus.—Billard, 1910:8.
Campanularia marginata.—Nutting, 1915:44, pl. 6, figs. 5–7.
Leptoscyphus marginatus.—Jäderholm, 1920:3.
Cnidoscyphus marginatus.—Splettstösser, 1929:88, 125, figs. 83–88.—Calder, 1976: 169.—Calder and Hester, 1978:91.

Collection record.—Sta. B002, dredge, 12 Aug 1974.

Description.—Specimen fragmentary, 2.8 cm high; hydrocaulus 0.8 mm wide, monosiphonic, straight basally, zigzag distally, divided by transverse nodes; perisarc thick. Each internode with a distal apophysis bearing a hydrotheca; every third internode with a second apophysis near the first; second apophysis large, supporting a branch; branches and hydrothecae given off alternately from opposite sides of hydrocaulus. Branches nearly perpendicular to hydrocaulus, lacking secondary branches in present material; internodes zigzag, similar to those of hydrocaulus but more slender. Hydrothecae 1112–1264 μm long from apophysis to margin, cone-shaped; pedicel very short; base asymmetrical, with adcau-

line wall convex, abcauline wall nearly straight; diaphragm distinct, basal chamber small; margin entire, with a ring-like edge; aperture round, 562–655 μm wide.

Gonothecae absent.

Remarks.—I follow Millard (1975) in regarding the genus *Cnidoscyphus* Splettstösser, 1929, as a synonym of *Thyroscyphus* Allman, 1877. *Obelia marginata* Allman, 1877 from the Atlantic belongs to *Thyroscyphus,* as does *Campanularia marginata* Bale, 1884, from Australia (Bale 1915). A new name, *Thyroscyphus balei,* is proposed here for the junior secondary homonym *T. marginatus* (Bale 1884). *Thyroscyphus marginatus* is common to abundant in tropical and subtropical waters of the western North Atlantic, apparently reaching the northern limit of its range off the coast of the Carolinas (Nutting 1915; Fraser 1944; Cain 1972). While it is frequent on hard banks off the coasts of Georgia and the Carolinas, only one fragmentary colony was collected during this study in estuarine areas of South Carolina.

Known range.—Western Atlantic: North Carolina to Venezuela; Bermuda. Elsewhere: Tropical west coast of Africa.

Family Plumulariidae L. Agassiz, 1862
Subfamily Halopterinae Millard, 1962
Monostaechas Allman, 1877
Monostaechas quadridens (McCrady, 1859)
Fig. 9

Plumularia quadridens McCrady, 1859:199.

Monostaechas dichotoma Allman, 1877:37, pl. 22, figs. 1–5.

Monostaechas quadridens.—Nutting, 1900:75, pl. 13, figs. 1–4.—Fraser, 1912: 380, fig. 46; 1943:95; 1944:334, fig. 343.—Calder, 1976:169.—Calder and Hester, 1978:91.

Monostaechas fisheri var. *simplex* Billard, 1913:16, fig. 7 (not *Monostaechas fisheri* Nutting, 1905).

Monostaechas quadridens f. *stechowi* Leloup, 1935:2, figs. 2, 3.

Collection record.—Sta. P006, trawl, 12 Jan 1976.

Description.—Colonies reaching 8.5 cm high; hydrocaulus monosiphonic, 260 μm in diameter, perisarc thick. Basal internodes very long, athecate, with numerous movable, 2 chambered nematothecae, most of which are missing in present specimens, giving rise via two curved apophyses to a pair of opposite upward-directed branches just below a hydrothecate segment, athecate and thecate segments of hydrocaulus separated by an oblique hinge-joint. Branches resembling hydrocaulus and rebranched in like manner, the whole colony thus appearing to be dichotomously branched; some distal branches with a single branch-bearing apophysis below thecate segment. Hydrothecate segments up to 1 cm long, consisting of alternating hydrothecate and athecate internodes. Thecate internodes 456–644 μm long with an oblique hinge-joint proximally and a transverse node distally, each such internode with a hydrotheca, a movable median inferior nematotheca with a scoop-shaped aperture, a reduced median superior nematotheca, and a pair of movable trumpet-shaped lateral nematothecae on distinct apophyses adnate to hydrothecal wall. Athecate internodes 316–538 μm long with a transverse node proximally and an oblique hinge-joint distally, with 1–2 movable

nematothecae, each with a scoop-shaped aperture. Hydrotheca cup-shaped, 263–316 μm deep; main axis oblique to internode; abcauline wall slightly convex, 222–269 μm long; free part of adcauline wall straight or slightly concave, 105–164 μm long; margin entire, circular, aperture diameter 269–322 μm.

Gonothecae absent.

Remarks.—McCrady's (1859) type-material of *M. quadridens* from the Charleston Harbor area was found floating in the water, and specimens collected in an otter trawl from Port Royal Sound during this study were also all unattached. Attached hydroids of *M. quadridens* are abundant on ledges of the inner continental shelf off South Carolina, and the species is probably carried into estuaries of the state by water currents.

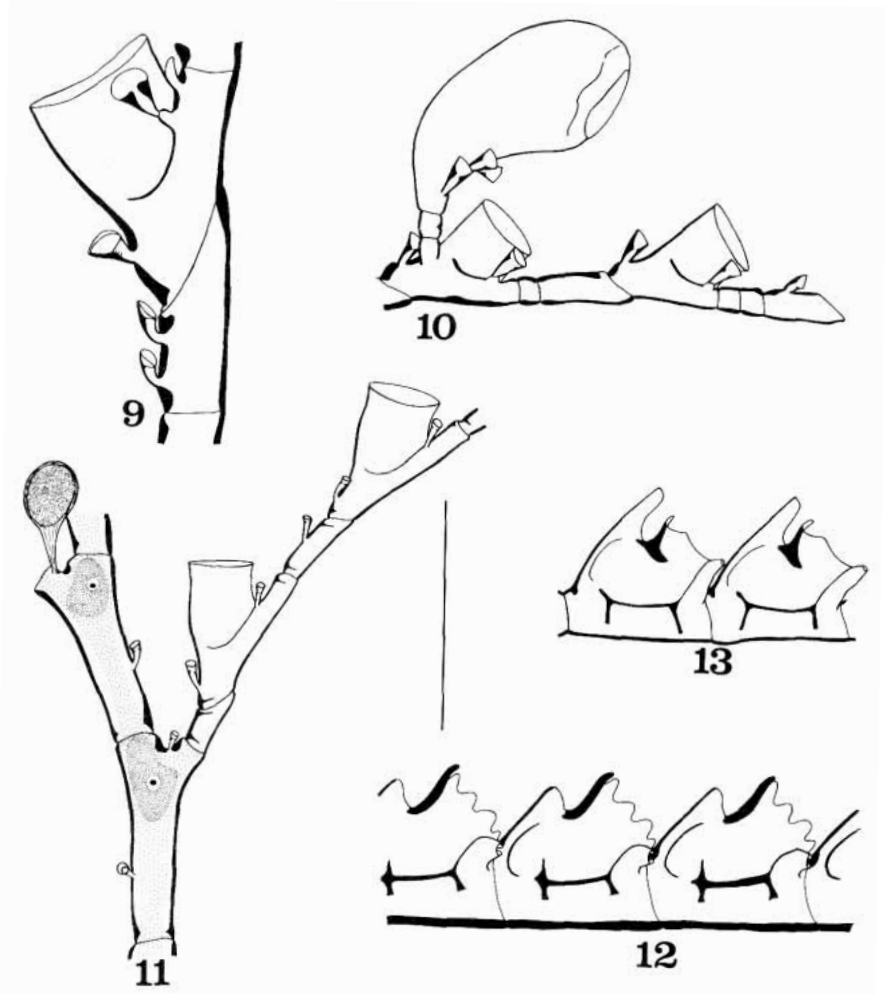
Known range.—Western Atlantic: Massachusetts to Brazil. Elsewhere: Circumglobal, tropical and subtropical waters.

Schizotricha Allman, 1883
Schizotricha tenella (Verrill, 1874)
Fig. 10

Plumularia tenella Verrill, 1874:731.
Schizotricha tenella.—Nutting, 1900:80, pl. 4, figs. 4, 5.—Fraser, 1912:383, fig. 52.—Calder, 1976:169.—Calder and Hester, 1978:91.
Halopteris tenella.—Vervoort, 1968:108.

Collection records.—Sta. LRA7, dredge, 21 Apr 1976. Sta. LRA8, dredge, 21 Apr 1976. Sta. MI07, dredge, 29 May 1975. Sta. MI09, dredge, 29 May 1975. Sta. MI12, dredge, 29 May 1975. Sta. MI13, dredge, 29 May 1975. Sta. MI15, dredge, 29 May 1975. Sta. MI16, dredge, 29 May 1975. Sta. MI17, dredge, 29 May 1975. Sta. BB01, dredge, 11 Aug 1977. Sta. BB02, dredge, 11 Aug 1977. Sta. SB03, dredge, 22 Aug 1977, 28 Apr 1978, 25 July 1978. Sta. SB04, dredge, 22 Aug 1977, 25 July 1978. Sta. SB08, dredge, 22 Aug 1977, 25 May 1978, 25 July 1978. Sta. SB13, dredge, 22 Aug 1977, 28 Apr 1978, 25 July 1978. Sta. SB18, dredge, 22 Aug 1977, 25 Apr 1978, 25 July 1978. Sta. B002, dredge, 15 Apr 1974, 22 Oct 1974, 5 Jan 1976. Sta. B001, dredge, 2 Apr 1976. Sta. E001, dredge, 2 Apr 1974, 2 Aug 1974. Sta. E003, dredge, 2 Apr 1974, 2 Aug 1974, 3 Oct 1974. Sta. E008, dredge, 2 Oct 1974. Sta. DE01, dredge, 13 June 1978. Sta. DE05, dredge, 21 Nov 1977, 15 Dec 1977, 13 June 1978, 17 Oct 1978. Sta. DE06, dredge, 21 Nov 1977, 15 Dec 1977, 13 June 1978. Sta. DE07, dredge, 21 Nov 1977, 17 Oct 1978. Sta. DE10, dredge, 21 Nov 1977, 13 June 1978, 17 Oct 1978. Sta. BR08, dredge, 27 Mar 1974, 8 Oct 1975.

Description.—Colonies up to 3 cm high. Hydrocaulus monosiphonic, slightly zigzag, unbranched, basal region with hydrothecae, nematothecae, and hydrocladia often missing, divided beyond basal region into alternating hydrothecate and athecate internodes. Internodes of variable length and diameter, usually longer and thicker toward proximal end of hydrocaulus. Hydrothecate internodes with an oblique joint proximally and a transverse or slightly oblique node distally, the latter often indistinct; each thecate internode with one hydrotheca, one median inferior nematotheca, 2 lateral nematothecae, an occasional median superior nematotheca, and an apophysis near base of hydrotheca. Athecate internodes with a slightly oblique node proximally and an oblique joint distally, 1–4 nematothecae.



Figs. 9–13. Family Plumulariidae. 9, *Monostaechas quadridens,* hydrotheca, station P006; 10, *Schizotricha tenella,* hydrothecae and gonotheca, station BR08; 11, *Plumularia floridana,* hydrothecae and gonotheca, station B001; 12, *Aglaophenia trifida,* hydrothecae, station CH00; 13, *Macrorhynchia philippina,* hydrothecae, station BR08, scale bars = 500 μm.

Apophyses long, given off alternately from opposite sides of hydrocaulus, supporting unbranched or alternately branched hydrocladia. Hydrocladia up to 7 mm long, typically consisting of a series of 3 types of internodes; a very short athecate internode lacking nematothecae, nodes transverse at both ends; a longer athecate internode with 0–2 trumpet-shaped median nematothecae, proximal node transverse, distal node oblique; a long hydrothecate internode with a median inferior nematotheca, a hydrotheca, and a pair of trumpet-shaped lateral nematothecae, node oblique proximally, transverse distally. Nematothecae on both hydrocaulus and hydrocladia 2-chambered, movable. Hydrotheca cup-shaped, main axis oblique to hydroclade, abcauline wall nearly straight, 111–158 μm long, free adcauline wall concave, length 70–94 μm, margin entire, opening circular, aperture diameter 140–176 μm.

Gonotheca cornucopia-shaped with 3 nematothecae near base, 562–690 μm long, 263–316 μm wide, borne on a 2-segmented pedicel inserting near base of hydrotheca on hydrocaulus and hydrocladia.

Remarks.—Vannucci (1949) included this species in the synonymy of *Halopteris diaphana* (Heller, 1868). I regard the two as separate species for the following reasons. The presence of three types of hydrocladial internodes in *S. tenella* immediately distinguishes it from *H. diaphana,* which has but two types. Hydrocladia are usually branched in *S. tenella* and unbranched in *H. diaphana.* Finally, the largely temperate water *S. tenella* attains a much larger colony size than the tropical and subtropical *H. diaphana.*

Schizotricha tenella is the most widespread plumularian hydroid in temperate estuaries of the east coast of the United States (Nutting 1900, 1901; Fraser 1912, 1944; Calder 1971, 1976; Watling and Maurer 1972; Calder and Hester 1978). It is both euryhaline, penetrating up-estuary to a salinity of about 15‰, and eurythermal, having been collected during this study over a temperature range from 9–32°C.

Known range.—Western Atlantic: Massachusetts to the Caribbean Sea. Elsewhere: Eastern Pacific, from Southern California to Panama.

Subfamily Plumulariinae Agassiz, 1862
Plumularia Lamarck, 1816
Plumularia floridana Nutting, 1900
Fig. 11

Plumularia floridana Nutting, 1900:59, pl. 2, figs. 4, 5.—Fraser, 1912:381, fig. 49.—Calder, 1976:169.—Calder and Hester, 1978:91.

Collection records.—Sta. NS01, dredge, 6 Apr 1976. Sta. SB03, dredge, 25 July 1978. Sta. SB04, dredge, 25 July 1978. Sta. SB08, dredge, 25 July 1978. Sta. SB18, dredge, 22 Aug 1977. Sta. B002, dredge, 15 Apr 1974, 12 Aug 1974. Sta. B001, dredge, 16 Oct 1974, 13 Oct 1975, 2 Apr 1976. Sta. CH00, dredge, 13 Oct 1975. Sta. CH02, dredge, 10 Oct 1973. Sta. J002, trawl, 9 Oct 1973. Sta. E003, dredge, 8 Jan 1974, 2 Aug 1974, 3 Oct 1974. Sta. E005, dredge, 3 Oct 1974. Sta. E007, dredge, 2 Oct 1973. Sta. AC01, Petersen grab, 6 June 1973. Sta. DE01, dredge, 21 Oct 1977. Sta. DE04, dredge, 21 Nov 1977, 13 June 1978. Sta. DE05, dredge, 13 June 1978, 17 Oct 1978.

Description.—Hydrocaulus monosiphonic, straight, unbranched, reaching 2.5 cm high, divided beyond basal region by distinct, transverse nodes; internodes 293–480 μm long, 70–105 μm wide at nodes, each with a distal apophysis and 2 nematothecae, one beside apophysis and another proximal one on side opposite apophysis; apophyses given off alternately from opposite sides of hydrocaulus, giving rise to unbranched hydrocladia with 1–5 hydrothecae; hydrocladia up to 2 mm long, nodes alternately transverse and oblique, hydroclade with 1–3 short basal internodes lacking hydrothecae and nematothecae, remaining internodes alternately hydrothecate and athecate, internodes with 2 internodal septa, one near each extremity, often indistinct; thecate internodes 257–351 μm long with a median inferior nematotheca, a hydrotheca, and a pair of lateral nematothecae, lateral nematothecae not reaching hydrothecal margin; athecate internodes 94–257 μm long, usually with one median nematotheca, all nematothecae movable,

2-chambered, cone-shaped; hydrotheca cup-shaped, main axis oblique to hydroclade, abcauline wall 129–164 μm long, length adcauline wall free 70–105 μm, margin entire, aperture diameter 117–164 μm.

Female gonotheca oval with thin perisarc, 211–281 μm long, 99–123 μm wide when fully developed, borne on slender pedicels from anterior side of apophysis base, each containing one ovum or developing planula, additional ova visible in coenosarc of hydrocaulus, planula escaping from rupture at distal end of gonotheca.

Remarks.—This species closely resembles descriptions of *Plumularia alicia* Torrey, 1902 from California and Oregon, USA (Torrey 1902; Fraser 1937), *Plumularia* sp. from Queensland, Australia (Pennycuik 1959), and *P. pennycuikae* Millard and Bouillon, 1973 from the Seychelles (Millard and Bouillon 1973), Bonin Islands (Hirohito 1974), and Mozambique (Millard 1975). *Plumularia floridana* differs from these species chiefly in having one instead of two nematothecae in the axil between hydrocaulus and apophysis. *Plumularia indica* from India (Mammen 1965b) is similar, and like *P. floridana* has a single axillary nematotheca. If not conspecific, these hydroids must all be very closely related.

Known range.—Western Atlantic: North Carolina to Brazil; Bermuda; northward to Massachusetts on floating *Sargassum*. Elsewhere: Eastern Pacific, from Southern California to Ecuador.

Subfamily Aglaopheniinae Stechow, 1911
Aglaophenia Lamouroux, 1812
Aglaophenia trifida L. Agassiz, 1862
Fig. 12

Aglaophenia cristata.—McCrady, 1859:202 [not *Plumularia cristata* Lamarck, 1816 = *Aglaophenia pluma* (Linnaeus, 1758)].

Aglaophenia trifida L. Agassiz, 1862:358.—Calder, 1976:169.—Calder and Hester, 1978:91.

Aglaophenia rigida Allman, 1877:43, pl. 25, figs. 5–9.—Jäderholm, 1896:17.—Fraser, 1912:378, fig. 44.

Collection records.—Sta. YB02, dredge, 6 Jan 1977. Sta. NS00, trawl, 17 Dec 1974. Sta. NB02, trawl, 19 Dec 1974. Sta. CH00, trawl, 22 May 1974.

Description.—Colonies growing in tangled masses reaching 20 cm high. Hydrocaulus monosiphonic, wiry, slender, reaching 0.5 mm wide basally, occasionally unbranched but usually with long, widely-separated branches. Branches given off from front of hydrocaulus either singly or in pairs, frequently rebranched in like manner; paired branches when present arising from contiguous internodes. Hydrocaulus and branches divided by oblique nodes into short internodes measuring 300–560 μm long, each internode with one apophysis and 3 nematothecae, one proximal to, one on, and one in the axil of each apophysis, apophyses given off alternately from fronto-lateral surface of internodes. Hydrocladia reaching 13 mm long, nearly straight, absent only at base of hydrocaulus and some older branches, divided at regular intervals by slightly oblique nodes; internodes 281–351 μm long, 94–164 μm wide at nodes, each with one hydrotheca, one median inferior nematotheca, one pair of lateral nematothecae, and 2 internodal septa, one at base of intrathecal septum, the other at base of lateral nematothecae.

Hydrothecae cone-shaped, 269–328 μm long, 164–187 μm wide at aperture, occupying most of internode, orifice of one hydrotheca adjacent to base of next, adcauline wall convex, distal half of abcauline wall concave with thick perisarc, plane of orifice sloping. Margin with one median and 4 pairs of lateral teeth, teeth rounded, short intrathecal septum present basally. Nematothecae tubular, one-chambered, immovable; median nematotheca adnate to hydrotheca for much of its length, reaching halfway to hydrothecal margin, length free 23–47 μm; lateral nematothecae adnate to hydrotheca, reaching nearly to orifice.

Corbulae pod-shaped, 4 mm long, 770 μm wide, each occurring in place of a distal hydrocladium, borne on short pedicels consisting of an internode with one hydrotheca; either side of corbula with 11–13 gonohydrocladia, each with a row of about 6 nematophores; interior of corbula with oval gonothecae.

Remarks.—Two distinct colony forms of this species were found in estuaries of South Carolina. Hydroids from several shallow subtidal and intertidal areas (stations YB02, NS00, NB02), appeared to be dichotomously branched because the long branches arose singly from the hydrocaulus. A different colony form was evident in specimens collected from deeper water at station CH00 near the Charleston Harbor entrance. These hydroids had long branches arising in pairs from the hydrocaulus, their hydrocladia were longer, and the diameters of their hydrocauli were greater. Nevertheless, hydrothecae of the two forms were indistinguishable and the variation in colony form is believed to be environmentally induced.

Specimens of this species from Sullivans Island and Charleston, South Carolina, were identified by McCrady (1859) as *Aglaophenia cristata*. However, he believed that it was probably distinct from the species described from Europe by Lamarck (1816) as *Plumularia cristata* [=*Aglaophenia pluma* (Linnaeus, 1758)]. Agassiz (1862) provided a new name, *A. trifida,* for this hydroid but did not describe or illustrate it. Despite Fraser's (1944) apparent views to the contrary, Agassiz should be recognized as the author of the species because he provided the necessary "indication" required under Article 16 (ICZN).

There is nothing in the original description of *Aglaophenia rigida* by Allman (1877), or in subsequent descriptions of that species by later authors, that can be used to distinguish it from *A. trifida*. Although Nutting (1900) and Fraser (1944) reported differences in the number of marginal teeth between the two species, with eight in *A. rigida* and nine in *A. trifida,* such differences are nonexistent. The types of *A. rigida* (MCZ 2109) have nine marginal teeth. Accordingly, the species are regarded here as synonyms, with the name *A. trifida* L. Agassiz, 1862 having priority over *A. rigida* Allman, 1877.

Aglaophenia trifida bears considerable resemblance to descriptions of the cosmopolitan *A. pluma* (Linnaeus, 1758). Nutting (1900) compared specimens of *A. trifida* with material of *A. pluma* from Plymouth, England, and concluded that the two were different species. He observed that the abcauline wall of the hydrotheca distal to the median inferior nematotheca is less concave in *A. trifida* and that the corbulae of this species were much longer and more slender. For the present I prefer to treat *A. trifida* as a distinct species, but it may eventually be shown to be conspecific with *A. pluma*. Records of *A. pluma* from the western North Atlantic as *A. dichotoma* (Leloup 1937; Fraser 1944) and *A. pluma pluma*

(van Gemerden-Hoogeveen 1965) are probably based on hydroids identical with those identified here as *A. trifida*.

Known range.—Western Atlantic: North Carolina to the Caribbean Sea.

Macrorhynchia Kirchenpauer, 1872
Macrorhynchia philippina Kirchenpauer, 1872
Fig. 13

Aglaophenia (*Macrorhynchia*) *philippina* Kirchenpauer, 1872:29, 45, pls. 1, 2, 7, fig. 2b.

Aglaophenia urens.—Bale, 1884:155, pl. 14, fig. 6, pl. 17, fig. 9 (not *Aglaophenia urens* Kirchenpauer, 1872).

Lytocarpus phillipinus.—Bale, 1888:786, pl. 21, figs. 5–7 (*lapsus*).

Lytocarpus philippinus.—Marktanner-Turneretscher, 1890:274, pl. 6, fig. 16.—Fraser, 1912:379, fig. 45.—Calder, 1976:169.—Calder and Hester, 1978:91.

Lytocarpia philippina.—Stechow, 1919:132, fig. Z1.

Macrorhynchia philippina.—Stechow, 1923:241.

Collection records.—Sta. B003, dredge, 12 Aug 1974. Sta. B002, dredge, 13 Oct 1975. Sta. CI01, trawl, 5 Oct 1976. Sta. BR08, dredge, 8 Oct 1975. Sta. P006, trawl, 7 Aug 1974.

Description.—Irregularly, pinnately, or twice-pinnately branched colonies reaching 10 cm high. Hydrocaulus and branches curved gradually backward, polysiphonic except at distal ends, bearing hydrocladia except when these are broken off proximally; nodes indistinct; apophyses short, given off alternately from front of anterior stolon only, each apophysis bearing one rudimentary nematotheca and one axillary nematotheca, an additional nematotheca on stolon between adjacent apophyses. Hydrocladia up to 7 mm long, curved outward, nodes straight; internodes 257–374 μm long, 75–100 μm wide at nodes, each with one hydrotheca, one median inferior nematotheca, one pair of lateral nematothecae, and 2 septa. Hydrothecae boot-shaped, 257–316 μm long, 140–187 μm wide at aperture; abcauline wall with a distinct inward-projecting intrathecal septum, adcauline wall with a short intrathecal septum basally; margin with low, rounded lateral teeth and an acute median tooth. Nematothecae tubular, one-chambered, immovable; median inferior nematotheca long, adnate to hydrotheca proximally, reaching beyond margin of hydrotheca distally, length free 82–140 μm, internal aperture diameter 11–19 μm; lateral nematothecae projecting a short distance beyond hydrothecal margin distally, otherwise adnate to hydrotheca.

Phylactocarpia up to 2.5 mm long, occurring in place of hydrocladia. Basal internode of phylactocarp with a hydrotheca, a median inferior nematotheca, a pair of lateral nematothecae, and 2 internodal septa; terminal internode also hydrothecate, or with nematothecae only; intermediate internodes modified, one or more bearing gonothecae, nematothecae well-developed. Gonothecae disc-shaped, 1217–1287 μm wide, 1193–1463 μm high, 550–667 μm thick; 1–3 per phylactocarp.

Remarks.—Following authors such as Stechow (1923), Vannucci Mendes (1946), Mammen (1965b) and Gravier (1970), Kirchenpauer's (1872) subgenus *Macrorhynchia* is recognized as a distinct genus, and *Lytocarpus* Allman, 1883 is regarded as a synonym.

According to the literature (Gravely 1927; Halstead 1965), this hydroid is capable of stinging humans.

Known range.—Western Atlantic: North Carolina to Brazil; Bermuda. Elsewhere: Circumglobal, tropical and subtropical waters.

Acknowledgments

Materials for this study were collected while I was a staff member of the Marine Resources Research Institute, Charleston, South Carolina. Field work was supported by funds from the Coastal Plains Regional Commission (Contract No. 10340031), the U.S. Army Corps of Engineers (Contract Nos. DACW60-75-C-0016, DACW60-76-C-0017, DACW60-77-C-0013), and the South Carolina Coastal Council. Thanks are due to Magdalene Maclin, Billy Boothe, David Knott, and Dr. Robert Van Dolah for assistance in the field. I am also indebted to Dr. K. P. Sebens of the Museum of Comparative Zoology at Harvard University and Dr. F. M. Bayer of the National Museum of Natural History, Smithsonian Institution, for the loan of specimens. Mr. A. Sanders kindly permitted access to invertebrate collections at the Charleston Museum in a search for any hydrozoan materials collected by John McCrady. Finally, I thank an anonymous reviewer for constructive criticisms.

Literature Cited

Agassiz, L. 1862. Contributions to the natural history of the United States of America. Volume 4.—Little, Brown and Company, Boston, 380 pp.

Alder, J. 1856. A notice of some new genera and species of British hydroid zoophytes.—Annals and Magazine of Natural History (2)18:353–362.

Allman, G. J. 1877. Report on the Hydroida collected during the exploration of the Gulf Stream by L. F. de Pourtalès, assistant United States Coast Survey.—Memoirs of the Museum of Comparative Zoology at Harvard College 5(2):1–66.

———. 1883. Report on the Hydroida dredged by H.M.S. Challenger during the years 1873–1876. Part I. Plumularidae.—Report on the Scientific Results of the Voyage of H.M.S. Challenger during the Years 1873–1876, Zoology 7:1–54.

———. 1885. Description of Australian, Cape and other Hydroida, mostly new, from the collection of Miss H. Gatty.—Journal of the Linnaean Society 19:132–161.

———. 1888. Report on the Hydroida dredged by H.M.S. Challenger during the years 1873–1876. Part II. The Tubularinae, Corymorphinae, Campanularinae, Sertularinae, and Thalamophora.—Report on the Scientific Results of the Voyage of H.M.S. Challenger during the Years 1873–1876, Zoology 23:1–90.

Bale, W. M. 1884. Catalogue of the Australian hydroid zoophytes.—Australian Museum, Sydney, 198 pp.

———. 1888. On some new and rare Hydroida in the Australian Museum collection.—Proceedings of the Linnaean Society of New South Wales 3:745–799.

———. 1913. Further notes on Australian hydroids. II.—Proceedings of the Royal Society of Victoria (new series) 26:114–147.

———. 1915. Report on the Hydroida collected in the Great Australian Bight and other localities. Part III.—Zoological Results of the Fishing Experiments carried out by F.I.S. "Endeavour" 3:241–336.

Bennitt, R. 1922. Additions to the hydroid fauna of the Bermudas.—Proceedings of the American Academy of Arts and Sciences 57:241–259.

Billard, A. 1910. Revision d'une partie des hydroïdes du British Museum.—Annales Sciences Naturelles, Zoologie 11:1–67.

———. 1912. Hydroïdes de Roscoff.—Archives de Zoologie Expérimentale et Générale 51:459–478.

———. 1913. Les hydroïdes de l'expédition du Siboga. I. Plumulariidae.—Siboga-Expeditie, Monographie 7a:1–115.

———. 1919. Note sur quelques espèces nouvelles de Sertularella de l'expédition du "Siboga."—Archives de Zoologie Expérimentale et Générale 58:18–23.

———. 1924. Note sur quelques espèces la plupart nouvelles de synthecides et de sertularides du "Siboga."—Bulletin de la Société Zoologique de France 49:646–652.

———. 1925. Les hydroïdes de l'Expédition du Siboga. II. Synthecidae et Sertularidae.—Siboga-Expeditie, Monographie 7b:115–232.

Blanco, O. M. 1968. Nueva contribucion al conocimiento de la fauna marina hidroide.—Revista del Museo de la Plata (Nueva Serie), Sección Zoologia 10:195–224.

Brooks, W. K. 1886. The life-history of the Hydromedusae: A discussion of the origin of the medusae, and of the significance of metagenesis.—Memoirs of the Boston Society of Natural History 3:359–430.

Cain, T. D. 1972. Additional epifauna of a reef off North Carolina.—Journal of the Elisha Mitchell Scientific Society 88:79–82.

Calder, D. R. 1971. Hydroids and Hydromedusae of southern Chesapeake Bay.—Virginia Institute of Marine Science Special Papers in Marine Science 1, 125 pp.

———. 1976. The zonation of hydroids along salinity gradients in South Carolina estuaries.—*In* G. O. Mackie, ed., Coelenterate Ecology and Behavior, Plenum Press, New York, pp. 165–174.

———, and B. S. Hester. 1978. Phylum Cnidaria.—*In* R. G. Zingmark, ed., A Checklist of the Biota of the Coastal Zone of South Carolina, University of South Carolina Press, Columbia, pp. 87–93.

Clarke, S. F. 1879. Report on the Hydroida collected during the exploration of the Gulf Stream and Gulf of Mexico by Alexander Agassiz, 1877–1878.—Bulletin of the Museum of Comparative Zoology at Harvard College 5:239–252.

Cornelius, P. F. S. 1979. A revision of the species of Sertulariidae (Coelenterata: Hydroida) recorded from Britain and nearby seas.—Bulletin of the British Museum (Natural History), Zoology Series 34:243–321.

Coughtrey, M. 1876. Critical notes on the New Zealand Hydroida.—Transactions and Proceedings of the New Zealand Institute 8:298–302.

Dean, T. A., and V. J. Bellis. 1975. Seasonal and spatial distribution of epifauna in the Pamlico River estuary, North Carolina.—Journal of the Elisha Mitchell Scientific Society 91:1–12.

Ellis, J., and D. Solander. 1786. The natural history of many curious and uncommon zoophytes, collected from various parts of the globe by the late J. Ellis. . . . Systematically arranged and described by the late Daniel Solander. . . . London, 208 pp.

Fewkes, J. W. 1881. Reports on the results of dredgings, under the supervision of Alexander Agassiz, in the Caribbean Sea, in 1878, 1879, and along the Atlantic coast of the United States during the summer of 1880, by the U.S. Coast Survey steamer "Blake." XI. Report on the Acalephae.—Bulletin of the Museum of Comparative Zoology at Harvard College 8:127–140.

Fleming, J. 1828. A History of British Animals. Bell and Bradfute, Edinburgh, 565 pp.

Fraser, C. M. 1912. Some hydroids of Beaufort, North Carolina.—Bulletin of the United States Bureau of Fisheries 30:339–387.

———. 1913. Hydroids from Nova Scotia.—Victoria Memorial Museum Bulletin Number 1:157–186.

———. 1937. Hydroids of the Pacific coast of Canada and the United States.—University of Toronto Press, Toronto, 207 pp.

———. 1943. Distribution records of some hydroids in the collection of the Museum of Comparative Zoölogy at Harvard College, with description of new genera and new species.—Proceedings of the New England Zoological Club 22:75–98.

———. 1944. Hydroids of the Atlantic Coast of North America.—University of Toronto Press, Toronto, 451 pp.

———. 1948. Hydroids of the Allan Hancock Pacific expeditions since March, 1938.—Allan Hancock Pacific Expeditions 4:179–335.

Garcia, P., A. Aguirre, and D. Gonzalez. 1980. Contribucion al conocimiento de los hidrozoos de las costas Españolas. Parte III. "Sertulariidae."—Boletin del Instituto Español de Oceanografia 6:5–67.

Gemerden-Hoogeveen, G. C. H. van. 1965. Hydroids of the Caribbean: Sertulariidae, Plumulariidae and Aglaopheniidae.—Studies on the Fauna of Curaçao and other Caribbean Islands 22:1–87.

Gravely, **F. H.** 1927. The littoral fauna of Krusadai Island in the Gulf of Manaar. Hydrozoa.—**Bulletin** of the Madras Government Museum (New Series, Natural History) 1:7–20.

Gravier, **N. 1970.** Libération de médusoïdes par *Macrorhynchia philippina* Kirchenpauer, 1872 (Hydroida, Plumulariidae).—Recueil des Travaux de la Station Marine d'Endoume (Fascicule Hors Série), Supplement Numereau 10:253–257.

Gray, J. E. 1848. List of the specimens of British animals in the collection of the British Museum. Part 1. Centroniae or radiated animals. London.

Halstead, B. W. 1965. Poisonous and venomous marine animals of the world. I. Invertebrates.—United States Government Printing Office, Washington, D.C., 994 pp.

Hargitt, C. W. 1908. Notes on a few coelenterates of Woods Hole.—Biological Bulletin 14:95–120.

Hartlaub, C. 1905. Die Hydroiden der magalhaenischen Region und chilenischen Küste.—Zoologische Jahrbücher, Supplement 6:497–714.

Hassall, A. H. 1848. Definitions of three new British zoophytes.—Zoologist 6:2223.

Heller, C. 1868. Die Zoophyten und Echinodermen des Adriatischen Meeres.—Verhandlungen der Zoologisch-Botanischen Gesellschaft in Wien 18:1–88.

Hincks, T. 1868. A history of the British hydroid zoophytes, Vol. I.—John van Voorst, London, 338 pp.

Hirohito, Emperor of Japan. 1969. Some hydroids of the Amakusa Islands.—Biological Laboratory, Imperial Household, Tokyo, 32 pp.

———. 1974. Some hydroids of the Bonin Islands.—Biological Laboratory, Imperial Household, Tokyo, 55 pp.

Howard, J. D., and R. W. Frey. 1975. Estuaries of the Georgia coast, U.S.A.: Sedimentology and biology. I. Introduction.—Senckenbergiana Maritima 7:1–31.

Jäderholm, E. 1896. Ueber aussereuropäische Hydroiden des Zoologischen Museums der Universität Upsala.—Bihang till Svenska Vetenskapsakademiens Handlingar 21 IV(6):1–20.

———. 1903. Aussereuropäische Hydroiden im Swedischen Reichsmuseum.—Arkiv för Zoologi 1: 259–312.

———. 1920. On some exotic hydroids in the Swedish Zoological State Museum.—Arkiv för Zoologi 13(3):1–11.

Jarvis, F. E. 1922. The hydroids from the Chagos, Seychelles, and other islands and from the coasts of British East Africa and Zanzibar.—Transactions of the Linnaean Society of London (Zoology) 18:331–360.

Karlson, R. 1978. Predation and space utilization patterns in a marine epifaunal community.—Journal of Experimental Marine Biology and Ecology 31:225–239.

Kirchenpauer, G. H. 1864. Neue Sertulariden aus verschiedenen Hamburgischen Sammlungen, nebst allgemeinen Bemerkungen über Lamouroux's Gattung Dynamena.—Verhandlungen der K. Leopoldinisch-Carolinischen Deutschen Akademie der Naturforscher 31(3):1–16.

———. **1872.** Ueber die Hydroidenfamilie Plumularidae, einzelne Gruppen derselben und ihre Fruchtbehälter. I. *Aglaophenia* Lx.—Abhandlungen aus dem Gebiete der Naturwissenschaften, Hamburg 5:1–52.

Kühn, A. 1913. Entwicklungsgeschichte und Verwandtschaftsbeziehungen der Hydrozoen. I. Teil. Die Hydroiden.—Ergebnisse und Fortschritte der Zoologie 4:1–284.

Lamarck, J. P. B. A. de M. 1816. Histoire naturelle des animaux sans vertèbres. Ed. 2. Paris, 568 pp.

Lamouroux, J. V. F. 1812. Extrait d'un mémoire sur la classification des polypiers coralligènes non entièrement pierreux.—Nouveau Bulletin des Sciences pour la Société Philomatique de Paris 3:181–188.

———. 1816. Histoire des polypiers coralligènes flexibles, vulgairement nommés zoophytes. Caen, 560 pp.

———. 1821. Exposition méthodique des genres de l'ordre des polypiers, avec leur description et celle des principales espèces. Paris, 115 pp.

Leloup, E. 1935. Hydropolypes calyptoblastiques et siphonophores récoltés au cours de la croisière (1934–35) du navire-école Belge "Mercator".—Bulletin du Musée Royal d'Histoire Naturelle de Belgique 11:1–6.

———. 1937. Résultats scientifiques des croisières du navire-école Belge "Mercator". Vol. I. Hydroida.—Mémoires du Musée Royal d'Histoire Naturelle de Belgique 2, 9:91–121.

Linnaeus, C. 1758. Systema Naturae per Regna Tria Naturae, secundem Classes, Ordines, Genera, Species, cum characteribus, differentiis, Synonymis, Locis, Editio Decima, Reformata. Holmiae, 824 pp.

Mammen, T. A. **1965a.** On a collection of hydroids from South India. II. Suborder Thecata (excluding Family Plumulariidae).—Journal of the Marine Biological Association of India 7:1–57.

———. 1965b. On a collection of hydroids from South India. III. Family Plumulariidae.—Journal of the Marine Biological Association of India 7:291–324.

Marktanner-Turneretscher, G. 1890. Die Hydroiden des K.K. naturhistorischen Hofmuseums.—Annalen des Naturhistorischen Museums in Wien 5:195–286.

Mayer, A. G. 1910a. Medusae of the world. I. The Hydromedusae.—Carnegie Institution of Washington Publication 109:1–230.

———. 1910b. Medusae of the world. II. The Hydromedusae.—Carnegie Institution of Washington Publication 109:231–498.

McCrady, J. 1859. Gymnopthalmata of Charleston Harbor.—Proceedings of the Elliott Society of Natural History 1:103–221.

McDougall, K. D. 1943. Sessile marine invertebrates of Beaufort, North Carolina.—Ecological Monographs 13:321–374.

Millard, N. A. H. 1962. The Hydrozoa of the south and west coasts of South Africa. Part I. The Plumulariidae.—Annals of the South African Museum 46:261–319.

———, 1964. The Hydrozoa of the south and west coasts of South Africa. Part II. The Lafoeidae, Synthecidae and Sertulariidae.—Annals of the South African Museum 48:1–56.

———. 1975. Monograph on the Hydroida of southern Africa.—Annals of the South African Museum 68:1–513.

———, and J. Bouillon. **1973.** Hydroids from the Seychelles (Coelenterata).—Musée Royal de l'Afrique Centrale, Annales, Serie IN-8, Sciences Zoologiques 206:1–106.

———, and ———. 1974. A collection of hydroids from Moçambique, East Africa.—Annals of the South African Museum 65:1–40.

Nutting, C. C. 1900. American hydroids. Part I. The Plumularidae.—Smithsonian Institution, United States National Museum Special Bulletin 4(1):1–285.

———. 1901. The hydroids of the Woods Hole region.—Bulletin of the United States Bureau of Fisheries 19:325–386.

———. 1904. American hydroids. Part II. The Sertularidae.—Smithsonian Institution, United States National Museum Special Bulletin 4(2):1–325.

———. 1905. Hydroids of the Hawaiian Islands collected by the steamer Albatross in 1902.—Bulletin of the United States Fish Commission 23:931–959.

———. 1915. American hydroids. Section III. The Campanularidae and Bonneviellidae.—Smithsonian Institution, United States National Museum Special Bulletin 4(3):1–126.

Pearse, A. S. 1936. Estuarine animals at Beaufort, North Carolina.—Journal of the Elisha Mitchell Scientific Society 52:174–222.

———, and L. G. Williams. 1951. The biota of the reefs off the Carolinas.—Journal of the Elisha Mitchell Scientific Society 67:133–161.

Pennycuik, P. R. **1959.** Faunistic records from Queensland. Part V.—Marine and brackish water hydroids.—Papers from the Department of Zoology, University of Queensland 1:141–210.

Pictet, C. 1893. Étude sur les hydraires de la Baie d'Amboine.—Revue Suisse de Zoologie 1:1–64.

Ralph, P. M. 1961. New Zealand thecate hydroids. Part III—Family Sertulariidae.—Transactions of the Royal Society of New Zealand 88:749–838.

Ritchie, J. 1909a. Supplementary report on the hydroids of the Scottish National Antarctic Expedition.—Transactions of the Royal Society of Edinburgh 47:65–101.

———. 1909b. Two unrecorded Challenger hydroids from the Bermudas with a note on the synonymy of *Campanularia insignis*.—Zoologist 13:260–263.

Sandifer, P. A., T. I. J. Smith, and D. R. Calder. 1974. Hydrozoans as pests in closed-system culture of larval decapod crustaceans.—Aquaculture 4:55–59.

Splettstösser, W. 1929. Beiträge zur Kenntnis der Sertulariiden. *Thyroscyphus* Allm., *Cnidoscyphus* nov. gen., *Parascyphus* Ritchie.—Zoologische Jahrbücher, Systematik, Ökologie und Geographie der Tiere 58:1–134.

Stechow, E. 1911. Über Hydroiden der Deutschen Tiefsee-Expedition. Ein neues Genus thekater Hydroiden.—Zoologischer Anzeiger 37:193–197.

———. 1919. Zur Kenntnis der Hydroidenfauna des Mittelmeeres, Amerikas und anderer Gebiete, nebst Angaben über einige Kirchenpauer'sche Typen von Plumulariden.—Zoologische Jahrbücher, Systematik, Ökologie und Geographie der Tiere 42:1–172.

———, **1921.** Neue Genera und Species von Hydrozoen und anderen Evertebraten.—Archiv für Naturgeschichte 87:248–265.

———. 1923. Zur Kenntnis der Hydroidenfauna des Mittelmeeres, Amerikas und anderer Gebiete.—Zoologische Jahrbücher, Systematik, Ökologie und Geographie der Tiere 47:29–270.

———, and H. C. Müller. 1923. Hydroiden der Aru-Inseln.—Senckenbergische Naturforschende Gesellschaft 35:459–478.

Stephenson, T. A., and A. Stephenson. 1952. Life between tide-marks in North America. II. Northern Florida and the Carolinas.—Journal of Ecology 40:1–49.

Sutherland, J. P. 1977. Effect of *Schizoporella* (Ectoprocta) removal on the fouling community at Beaufort, North Carolina, USA.—*In* B. C. Coull, ed., Ecology of marine benthos. University of South Carolina Press, Columbia, pp. 155–176.

———. 1981. The fouling community at Beaufort, North Carolina: A study in stability.—American Naturalist 118:499–519.

———, and R. H. Karlson. 1977. Development and stability of the fouling community at Beaufort, North Carolina.—Ecological Monographs 47:425–446.

Thompson, D'A. W. 1879. On some new and rare hydroid zoophytes (Sertulariidae and Thuiariidae) from Australia and New Zealand.—Annals and Magazine of Natural History (5)3:97–114.

Thornely, L. R. 1904. Report on the Hydroida collected by Professor Herdman, at Ceylon, in 1902.—Report to the Government of Ceylon on the Pearl Oyster Fisheries of the Gulf of Manaar II, Supplementary Report 8:107–126.

Torrey, H. B. 1902. The Hydroida of the Pacific coast of North America, with especial reference to the species in the collection of the University of California.—University of California Publications, Zoology 1:1–104.

Totton, A. K. 1930. Coelenterata.—Part V.—Hydroida.—British Antarctic ("Terra Nova") Expedition, 1910, Natural History Reports, Zoology 5(5):131–252.

Vannucci, M. 1949. Hydrozoa do Brasil.—Boletim da Faculdade de Filosofia, Ciências e Letras, Universidade de São Paulo, Zoologia 14:219–265.

Vannucci Mendes, M. 1946. Hydroida Thecaphora do Brasil.—Arquivos de Zoologia do Estado de São Paulo 4:535–597.

Verrill, A. E. 1872. On Radiata from the coast of North Carolina.—American Journal of Science (3)3:432–438.

———. 1874. Report upon the invertebrate animals of Vineyard Sound and the adjacent waters, with an account of the physical features of the region.—Report of the Commissioner of Fisheries for 1871–1872:295–747.

———. 1900. Additions to the Anthozoa and Hydrozoa of the Bermudas.—Transactions of the Connecticut Academy of Arts and Sciences 10:551–572.

———. 1907. Characteristic life of the Bermuda coral reefs.—Transactions of the Connecticut Academy of Arts and Sciences 12:204–319.

Versluys, J., Jr. 1899. Hydraires calyptoblastes recueillis dans la Mer des Antilles pendant l'une des croisières accomplies par le Comte R. de Dalmas sur son yacht Chazalie.—Mémoires de la Société Zoologique de France 12:29–58.

Vervoort, W. 1968. Report on a collection of Hydroida from the Caribbean region, including an annotated checklist of Caribbean hydroids.—Zoologische Verhandelingen 92:1–124.

———. 1972. Hydroids from the Theta, Vema, and Yelcho cruises of the Lamont-Doherty Geological Observatory.—Zoologische Verhandelingen 120:1–247.

———, and P. Vasseur. 1977. Hydroids from French Polynesia with notes on distribution and ecology.—Zoologische Verhandelingen 159:1–98.

Watling, L., and D. Maurer. 1972. Shallow water hydroids of the Delaware Bay region.—Journal of Natural History 6:643–649.

Watson, J. E. 1973. Pearson Island Expedition 1969–9. Hydroids.—Transactions of the Royal Society of South Australia 97:153–200.

Wells, H. W. 1961. The fauna of oyster beds, with special reference to the salinity factor.—Ecological Monographs 31:239–266.

———, M. J. Wells, and I. E. Gray. 1964. The calico scallop community in North Carolina.—Bulletin of Marine Science of the Gulf and Caribbean 14:561–593.

Department of Invertebrate Zoology, Royal Ontario Museum, 100 Queen's Park, Toronto, Ontario M5S 2C6, Canada.